US009150264B2

(12) **United States Patent**
Monti et al.

(10) **Patent No.: US 9,150,264 B2**
(45) **Date of Patent: Oct. 6, 2015**

(54) **MOTOR VEHICLE ASSEMBLY LINE**

(75) Inventors: **Denny Monti**, Turin (IT); **Giulio Talarico**, Turin (IT); **Marco Cavaglia**, Turin (IT); **Elio Tordella**, Turin (IT)

(73) Assignee: **Fiat Group Automobile S.p.A.**, Turin (IT)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 62 days.

(21) Appl. No.: **14/125,915**

(22) PCT Filed: **Aug. 6, 2012**

(86) PCT No.: **PCT/IB2012/054011**
§ 371 (c)(1),
(2), (4) Date: **Mar. 20, 2014**

(87) PCT Pub. No.: **WO2013/018076**
PCT Pub. Date: **Feb. 7, 2013**

(65) **Prior Publication Data**

US 2014/0197011 A1 Jul. 17, 2014

(30) **Foreign Application Priority Data**

Aug. 4, 2011 (EP) 11425214

(51) **Int. Cl.**
B62D 65/18 (2006.01)
B65G 47/00 (2006.01)

(52) **U.S. Cl.**
CPC ***B62D 65/18*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,789,021 B2 * 9/2010 Nishihara et al. 105/153
2004/0206605 A1 * 10/2004 Shibata et al. 198/465.4
2007/0000758 A1 * 1/2007 Matsubara et al. 198/465.4

FOREIGN PATENT DOCUMENTS

DE 100 54 366 A1 5/2002
EP 1 093 864 A2 4/2001
JP 52-43277 4/1977

* cited by examiner

Primary Examiner — Kavel Singh
(74) *Attorney, Agent, or Firm* — Dickstein Shapiro LLP

(57) **ABSTRACT**

An assembly line for motor vehicles in which a overhead guide supports a plurality of conveying units, each of which has a longitudinal axis, is provided with a supporting element for a respective body to be assembled, and is mobile in a given direction of advance through one or more rotation stations, in each of which an drive assembly, carried by the rotation station, is designed to engage a driven transmission assembly, carried by the conveying unit, for rotating the supporting element about the longitudinal axis.

8 Claims, 6 Drawing Sheets

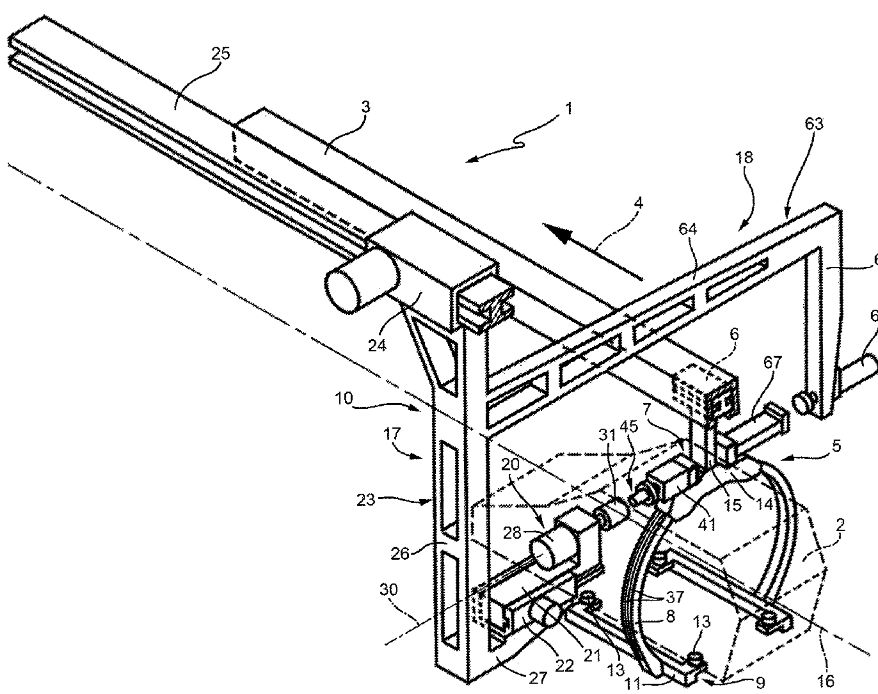
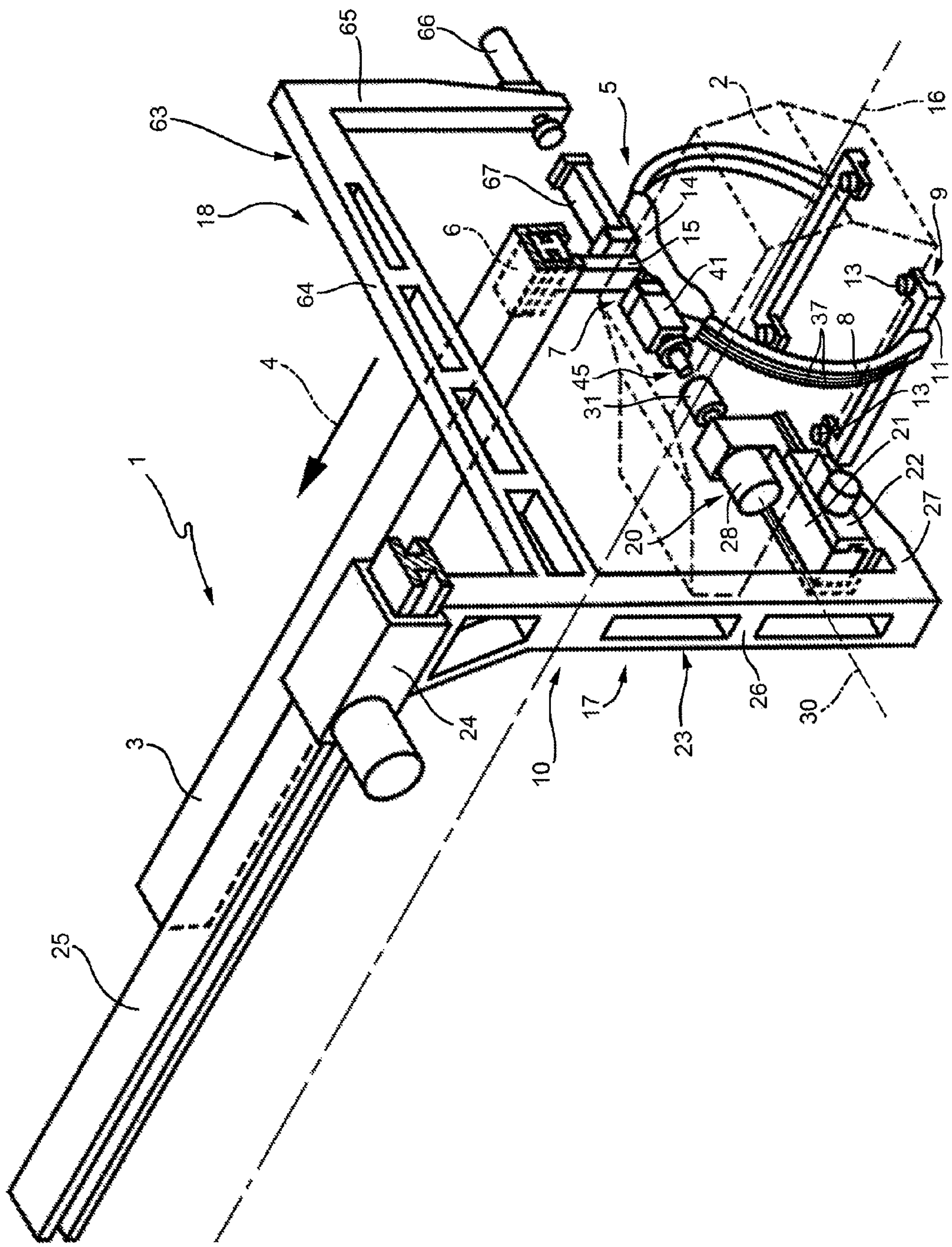


FIG. 1


1
2
3
4
5
6
7
8
9
10
11
13
13
14
15
16
17
18
20
21
22
23
24
25
26
27
28
30
31
37
41
45
63
64
65
66
67

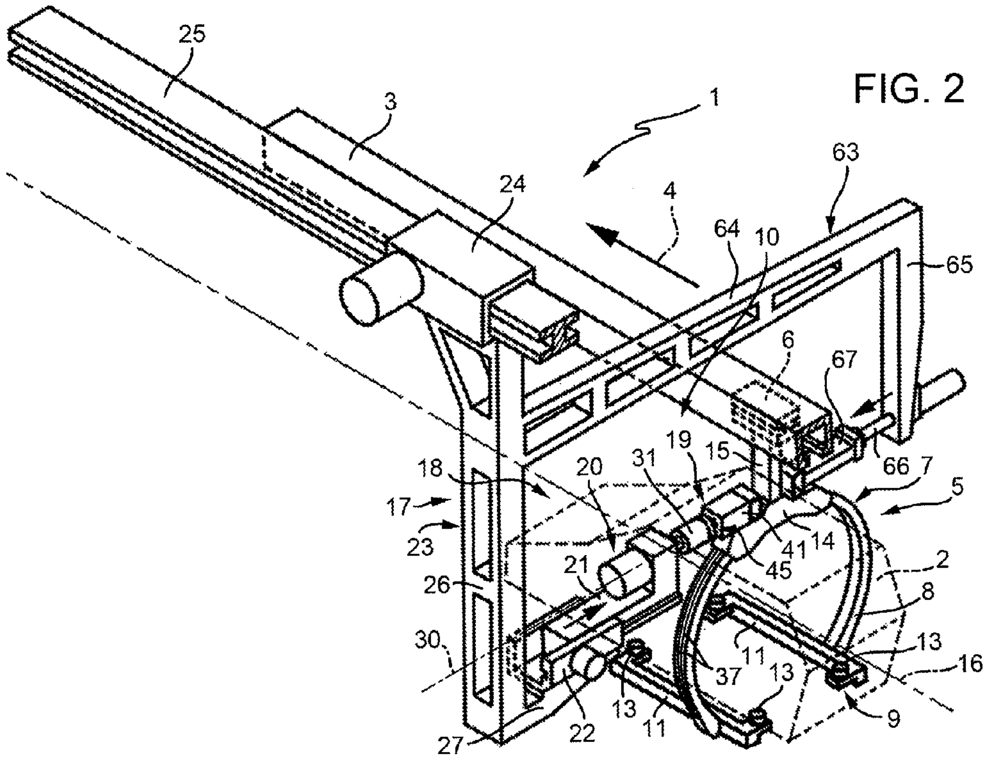

25
3
1
24
4
63
64
10
65
6
67
66
7
5
19
15
18
20
31
17
23
41
14
45
2
21
26
8
30
11
13
37
16
13
13
11
9
27
22

FIG. 2

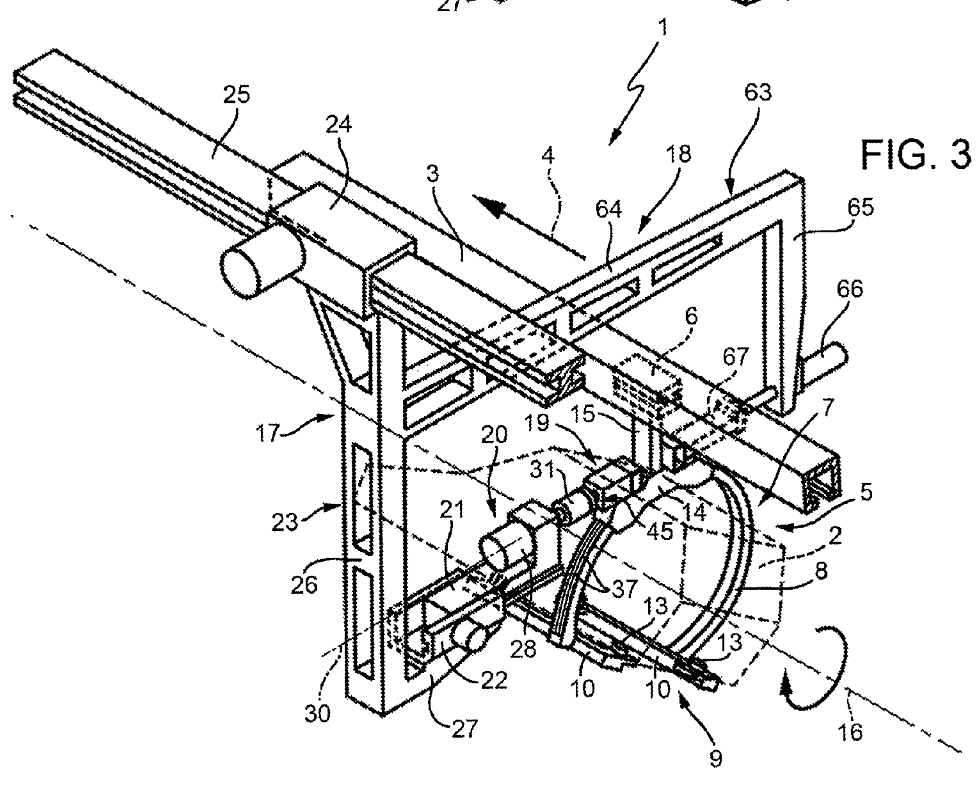
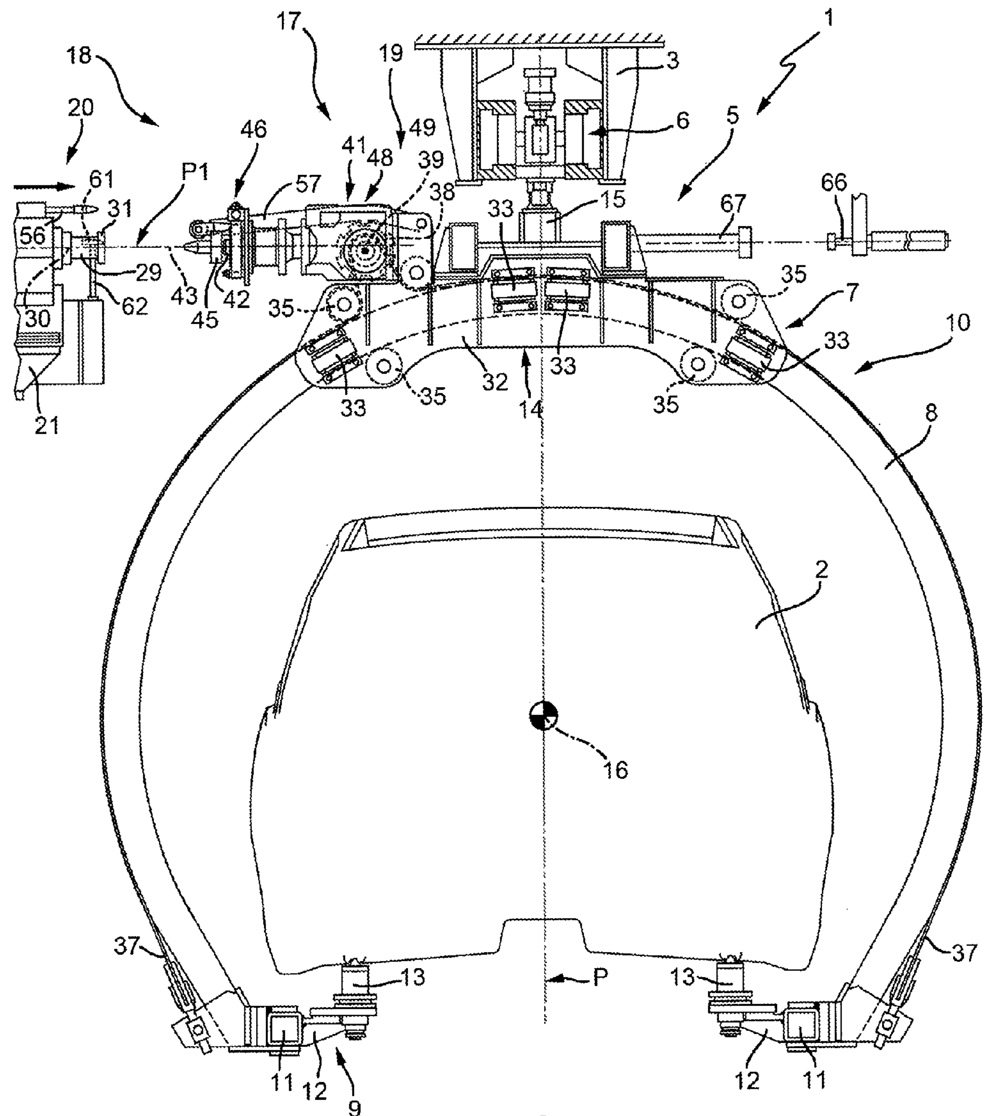

1
25
24
63
4
18
3
64
65
66
6
67
17
19
15
7
20
31
5
14
45
2
23
21
8
26
37
13
28
13
22
10
10
30
27
16
9

FIG. 3



1
3
6
5
15
17
18
19
49
20
46
41
48
39
38
61
P1
57
31
56
29
43
42
45
62
30
21
33
35
7
10
33
32
14
8
2
16
13
37
P
12
11
9
66
67

FIG. 4

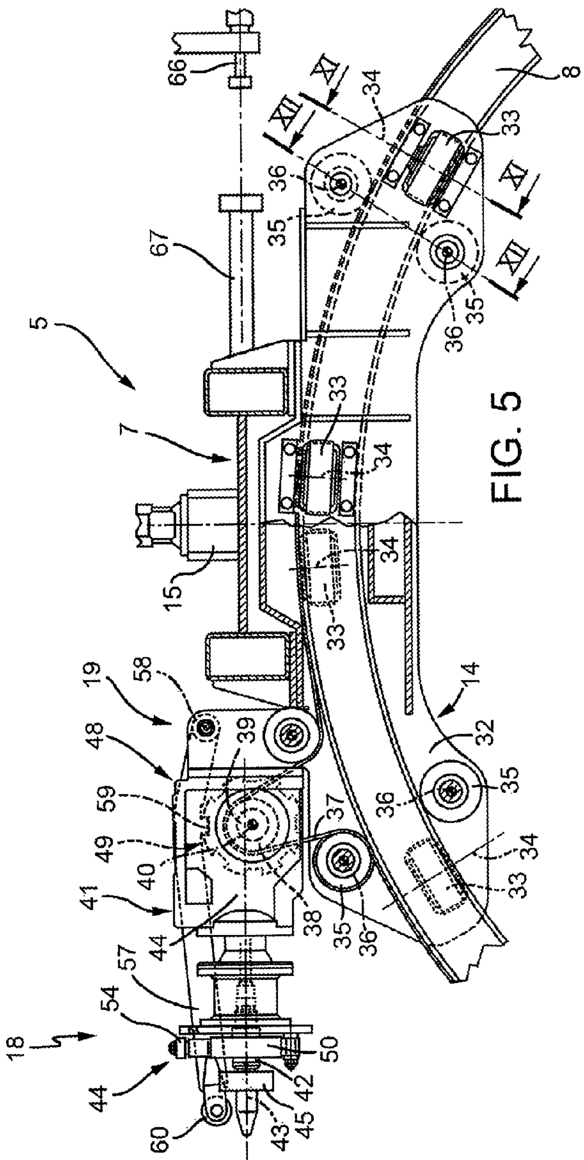


FIG. 5

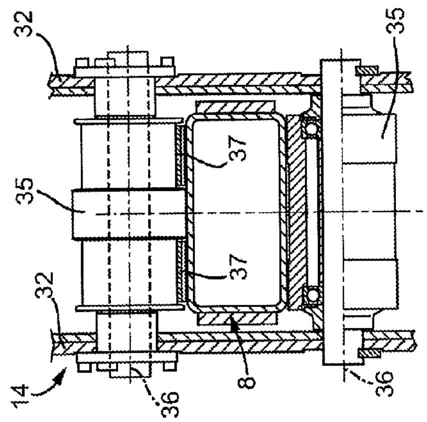


FIG. 12

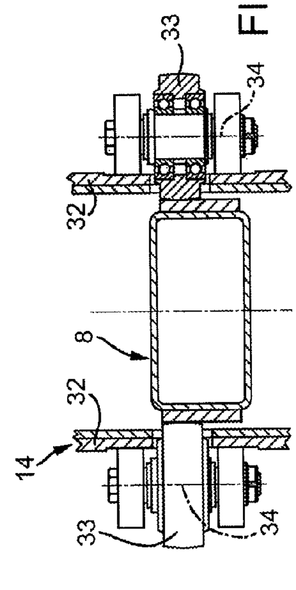


FIG. 11

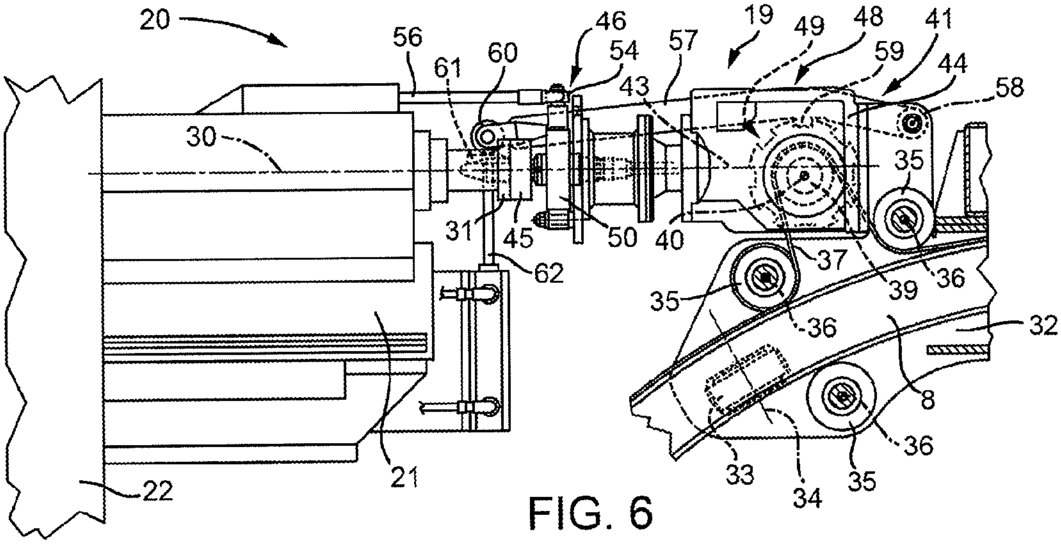


FIG. 6

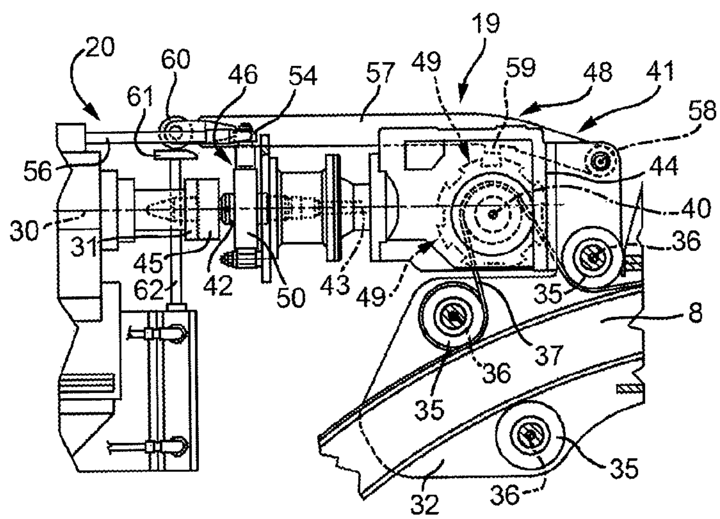


FIG. 7

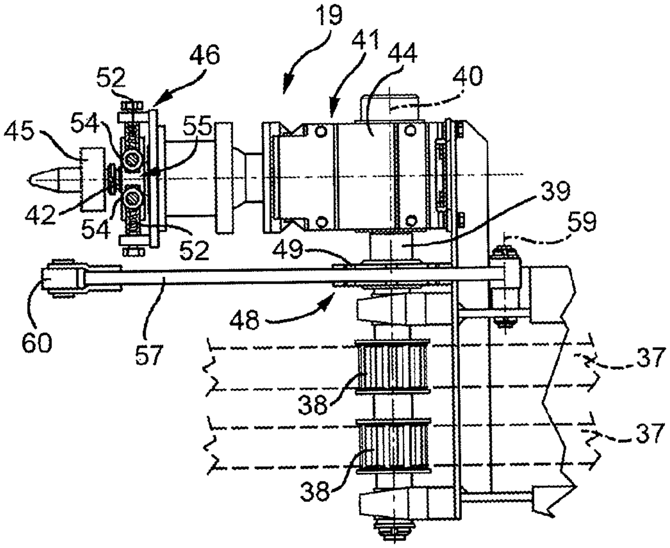


FIG. 13

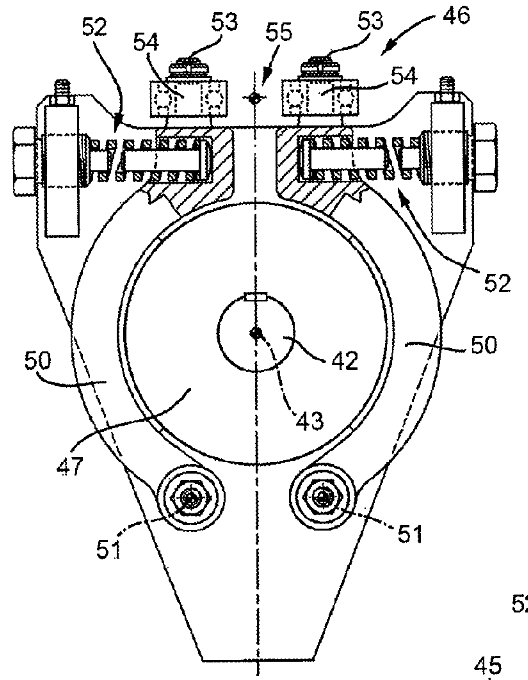


FIG. 10

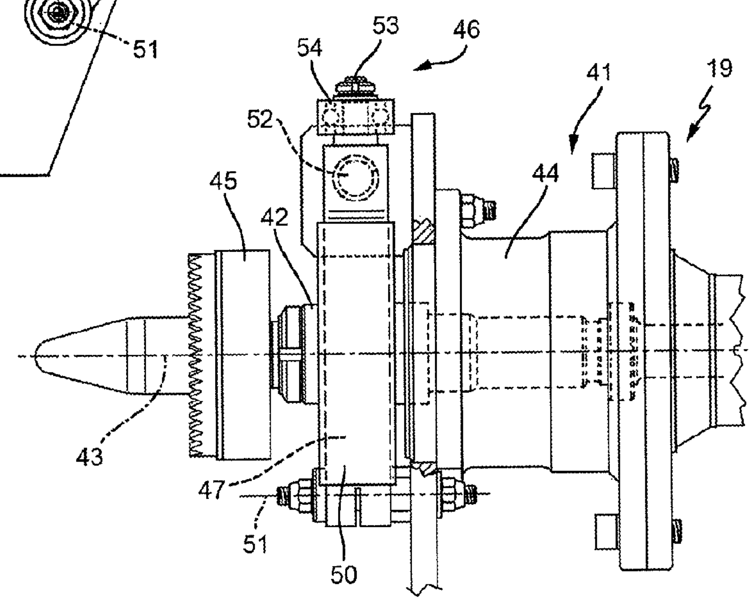


FIG. 9

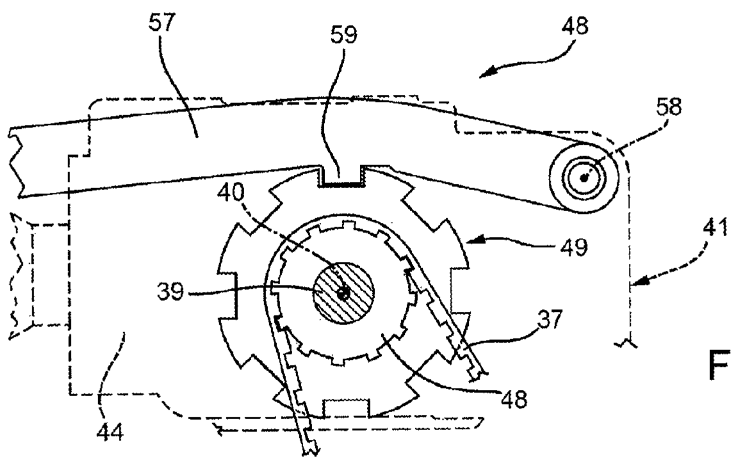


FIG. 8

MOTOR VEHICLE ASSEMBLY LINE

TECHNICAL SECTOR OF THE INVENTION

The present invention relates to an assembly line for motor vehicles, in particular road vehicles.

BACKGROUND ART

As is known, a motor-vehicle assembly line normally comprises a plurality of workstations aligned to, and set at a distance from, one another, a fixed conveying guide, which extends through the workstations in a given direction of advance, and a plurality of conveying units, each of which is designed to support a respective body and is mounted so as to slide along the conveying guide for displacing, with continuous or steplike motion, the body itself through the workstations.

In general, a conveying unit of a known type is defined by a gondola, which is suspended from a slide slidably coupled to the fixed guide and comprises an arched element designed to embrace laterally the body, and a supporting element, which is set at the free ends of the arched element and is designed so that it couples to the bottom panel of the body itself.

The suspension of the gondola from the slide is made in such a way as to enable the gondola to oscillate, with respect to the fixed guide, about an axis of its own parallel to the aforesaid direction of advance and to rotate the body between a normal plane position, where the bottom panel faces downwards and is substantially parallel to the floor, and a position rotated upwards, where the bottom panel is inclined, with respect to the floor, by a sufficiently wide angle, normally between 45° and 90° so as to enable operators to carry out work on the underbody conveniently.

To perform rotation of the gondola in given stages of the assembly process, it is known to provide, in the corresponding stretches of the assembly line, fixed deviator elements, each of which is shaped in such a way as to couple in succession to the arched elements and rotate each arched element by a respective pre-set angle. Each conveying unit is moreover provided with a blocking device designed to keep the respective arched element in the inclined position.

A solution of this type is known, for example, from JP 52002971 and JP 52043277. In particular, JP 52043277 discloses an arched hanger arm rotatably inserted between the two pairs of rotatable guide rollers which are rotatably supported by a suspension mechanism of an hanger body which is driven by a overhead conveyer 2. The hanger arm is provided on its outer peripheral edge with a chain extending therealong and is rotated by a rotation mechanism having a gear which engages with the chain. The rotation mechanism comprises a gear set mounted on the hanger body and comprising a first bevel gear coaxial to the gear which engages with the chain, a second bevel gear which engages with the first bevel gear, a spur gear coaxial to the second bevel gear, a rack which engages with the spur gear in parallel with the overhead conveyer and which is arranged so as to rotate the hanger arm, and a reversing rack which engages with the spur gear to thereby reverse the hanger arm. Thus, the hanger arm is rotated or returned in by the movement of the hanger body.

Even though widely used on account of its simplicity, such a solution suffers, however, from certain drawbacks that can be put down principally both to the fact that the deviator elements have relatively large overall dimensions, which obviously complicates the structure of the assembly line, and to the fact that the deviator elements, being fixed, do not

enable substantial modifications of the assembly process, for example modification of the stages of the process in which the bodies must be rotated, without considerable interventions of reconfiguration of the assembly line.

A further drawback derives from the fact that the fixed deviator elements, being "passive" elements, are able to perform rotation of the arched elements only when the respective conveying units displace, engaging with the deviator elements themselves, and consequently prove barely usable in the cases where the assembly line does not advance with continuous motion.

To overcome the above drawbacks, a different solution has been proposed, which envisages providing "on board" each conveying unit an electric actuator capable of rotating the respective arched element independently in pre-set workstations.

An example of this solution is provided by the document No. U.S. Pat. No. 5,234,096.

Albeit effective, said solution presents the drawback of proving considerably burdensome both from the standpoint of its construction and from the economic standpoint.

DESCRIPTION OF THE INVENTION

The aim of the present invention is to provide a motor-vehicle assembly line that will be free—from the drawbacks described above.

According to the present invention a motor-vehicle assembly line is provided according to the annexed claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described with reference to the annexed drawings, which illustrate a non-limiting example of embodiment thereof and in which:

FIG. **1** is a schematic illustration, in partial perspective view and with parts removed for reasons of clarity, of a preferred embodiment of the assembly line according to the present invention;

FIGS. **2** and **3** illustrate the assembly line of FIG. **1** in respective further operating configurations;

FIG. **4** is a view in front elevation and at an enlarged scale of a detail of FIG. **1**;

FIGS. **5** to **7** illustrate, at an enlarged scale and partially in cross section, a portion of the detail of FIG. **4** in respective operating configurations;

FIGS. **8** and **9** illustrate, at an enlarged scale, respective details of FIG. **5**;

FIG. **10** illustrates in front view and partially in cross section the detail of FIG. **9**;

FIG. **11** is a cross section, according to the line XI-XI, of FIG. **5**;

FIG. **12** is a cross section, according to the line XII-XII, of FIG. **5**; and

FIG. **13** is a plan view of a further detail of FIG. **5**.

PREFERRED EMBODIMENTS OF THE INVENTION

Designated as a whole by **1** in FIG. **1** is a motor-vehicle assembly line, in the case in point an automobile assembly line.

The assembly line **1** comprises a plurality of workstations, which are aligned and set at a distance from one another along a path of advance of a succession of car bodies **2** to be assembled (of which just one is illustrated).

For displacing the bodies **2**, the assembly line **1** is provided with a overhead fixed guide **3**, which extends through the workstations in a substantially horizontal direction of advance **4**, with a plurality of conveying units **5** (of which, just one is illustrated) slidably mounted along the fixed guide **3** and designed to support respective bodies **2**, and with actuating means (known and not illustrated) designed to displace the conveying units **5** along the fixed guide **3** with continuous or steplike motion.

The fixed guide **3** is defined by a rectilinear sectional element with C-shaped cross section mounted at a given distance from the ground, and each conveying unit **5** comprises a overhead slide **6**, slidably coupled to the fixed guide **3**, and a gondola **7**, which hangs from the slide **6** and in turn comprises an arched element **8** lying in a plane perpendicular to the direction of advance **4** and a supporting element **9** designed, in use, to be coupled rigidly to the bottom panel of a body **2** set through the arched element **8**. In this way, the bodies **2** are able to advance with the respective gondolas **7** along a conveying channel **10** that extends, in the direction of advance **4**, underneath the fixed guide **3** and through the workstations, and are raised from the ground by a distance such as to enable the operators to intervene conveniently on the bodies **2** in the workstations themselves.

According to what is illustrated in FIGS. **1** and **4**, the supporting element **9** of each conveying unit **5** comprises a pair of longitudinal members **11**, which are rigidly connected to respective free ends of the arched element **8**, are parallel to the direction of advance **4**, and are specular with respect to a plane of symmetry P (FIG. **4**) of the arched element **8** itself, and each have, at their own axial ends, two brackets **12** projecting towards the plane of symmetry P and provided with respective feeler pins **13**, designed to engage respective holes of the body **2** for blocking the body **2** itself on the longitudinal members **11**.

The suspension of the arched element **8** from the slide **6** is obtained via a frame **14**, which is rigidly connected to the slide **6** by means of a tie rod **15** and supports the arched element **8** so as to enable the latter to oscillate about an axis **16** passing through the centre of the arched element **8** and parallel to the direction of advance **4**. In this way, a body **2** fixed on the supporting element **9** can be rotated between a normal plane position, where the respective bottom panel is substantially horizontal and faces the ground, and a position rotated upwards, where the bottom panel is inclined, with respect to the ground, by an angle preferably comprised between 45° and 90° and sufficient to enable an operator to carry out conveniently the work on the underbody.

The rotation of the arched elements **8** is made, in use, in given rotation stations **17** (just one of which is illustrated) and by means of a rotation unit **18** which comprises, for each conveying unit **5**, a respective passive rotation assembly **19** carried by the conveying unit **5** itself, and, for each rotation station **17**, a respective active drive assembly **20** designed to be coupled in succession to each rotation assembly **19** when the latter is set in the rotation station **17** itself to impart on the respective arched element **8** a rotation about the axis **16**. All the rotation assemblies **19** are set, on the same side, on the respective conveying unit **5**, and all the drive assemblies **20** face one and the same side of the channel **10** for conveying the bodies **2**.

Illustrated in FIGS. **1**, **2** and **3** is just one rotation assembly **19**, associated to just the conveying unit **5** illustrated, and just one drive assembly **20**, associated to just the rotation station **17** illustrated.

Each drive assembly **20** is set, in the respective rotation station **17**, outside the channel **10** for conveying the bodies **2** and is carried by a motor-driven slide **21**, which is slidably coupled to a rectilinear guide **22** for displacing, in use, the respective, drive assembly **20** in a direction substantially horizontal and transverse to the direction of advance **4**, away from and towards an advanced position for coupling with the motor-reducer device **21** of the conveying unit **5** set, each time, in the rotation station **17**.

Furthermore, to enable the respective drive assembly **20** to couple to the rotation assemblies **19** whilst the latter displace with continuous motion through the respective rotation station **17**, each slide **21** is mounted in such a way as to enable the respective drive assembly **20** itself to displace alternatively, within the respective rotation station **17**, in the direction of advance **4**. For said purpose, according to what is illustrated in FIGS. **1**, **2**, and **3**, each slide **21** is mounted on a carriage **23**, which in turn comprises a motor-driven slide **24** slidably coupled to a fixed rectilinear guide **25**, set at a level higher than the one occupied by the fixed guide **3** and parallel to the direction of advance **4**. The carriage **23** further comprises a supporting arm **26**, which is fixed with respect to the slide **24**, extends from the slide **24** itself downwards and carries connected thereto, at its own bottom free end, a horizontal bracket **27**, which projects towards the conveying channel **10** and supports the guide **22** of the slide **21**.

According to what is illustrated in FIG. **1** and, in greater detail, in FIGS. **4** and **5**, each drive assembly **20** comprises an electric motor **28**, an output shaft **29** of which extends towards the conveying channel **10** along a horizontal axis **30**, transverse, to the direction of advance **4** and lying in a horizontal plane P1 set at a given level. The output shaft **29** carries connected thereto, at its own free end, a toothed front coupling **31**.

With reference to FIGS. **4**, **5**, **11** and **12**, the frame **14** comprises two plates **32**, which are transverse to the direction of advance **4**, are rigidly connected together by means of transverse stiffening plates and support a plurality of pairs of opposed rollers, which define, between the two plates **32**, a channel with a curvilinear profile, which shares the axis **16** and is slidably engaged by a central portion of the arched element **8**.

In particular, according to what is illustrated in FIGS. **5** and **11**, the aforesaid rollers comprise a plurality of rollers **33**, each of which is mounted on a respective plate for rotating idle about a respective axis **34** parallel to the plate **32** itself and transverse to the direction of advance **4**, is opposed to an identical roller **33** mounted on the other plate **32**, and extends partially through the respective plate **32** so as to slidably engage a respective side of the arched element **8**.

According to what is illustrated in FIGS. **5** and **12**, the aforesaid rollers further comprise two pairs of rollers **35** set in the proximity of respective free ends of the frame **14**. The rollers **35** of each pair are mounted through the plates **32** for rotating about respective axes **36** parallel to the direction of advance **4** and slidably engage an outer wall and, respectively, an inner wall of the arched element **8**.

According to what is illustrated in FIGS. **4**, **8** and **13**, the arched element **8** is run over externally by two cogged belts **37**, which form part of the rotation assembly **19** of the respective conveying unit **5** and are driven, in use, to cause the arched element **8** to oscillate about the axis **16**. For this purpose, each belt **37** is anchored, at its ends, to respective free ends of the arched element **8**, extends in contact with the outer surface of the arched element **8** itself, and comprises an intermediate portion, which is detached from the arched element **8** and is run over two return rollers, one of which is a roller **35**, and over a respective toothed pulley **38** set between the return rollers and fitted on a shaft **39** for rotating about an axis **40** parallel to the direction of advance **4**.

According to what is illustrated in FIGS. **5** and **13**, the shaft **39** defines the output shaft of a motor-reducer device **41**, which forms part of the rotation assembly **19** of the respective conveying unit **5** and is mounted on the frame **14** on the side facing the drive assemblies **20**. The motor-reducer device **41** comprises an input shaft **42**, which has an axis **43** transverse to the axis **40** and lying in the plane P**1**, and is kinematically connected to the shaft **39** via a series of gears (not illustrated) housed within a casing **44** rigidly connected to the frame **14**. The shaft **42** carries connected thereto, at its own free end, a torque transmission toothed front coupling **45**, designed to be coupled, in use, to the front coupling **31** of the shaft **29** when the respective drive assembly **20** is displaced in the aforesaid advanced coupling position.

In other worlds, shaft **29** is a torque takeoff and shaft **42** is an intake for the torque transmitted thereto by shaft **29** through torque transmitting coupling **31**, **45**.

According to what is illustrated in FIGS. **5** and **13**, each rotation assembly **19** further comprises a jaw brake **46**, which co-operates with a hub **47** carried by the shaft **42** for normally blocking the shaft **42** itself and, therewith, the belts **37**, and a safety blocking device **48** designed to co-operate with a toothed ring nut **49** fitted on the shaft **39** for normally blocking the shaft **39** itself and, therewith, the pulleys **38** and the belts **37**.

According to what is illustrated in FIGS. **9** and **10**, the jaw brake **46** comprises a pair of jaws **50**, which are pivoted on a plate fixed with respect to the casing **44** to oscillate about respective axes **51** set underneath the hub **47** and parallel to the axis **43**, and are pushed towards the hub **47** by respective spring devices **52**, each co-operating with the respective jaw **50** at the end thereof opposite to the one pivoted in **43**. Projecting upwards from the ends of the jaws **50** adjacent to the spring devices **52** are two pins **53** carrying respective rollers **54**, which define between them a channel **55** for insertion of an actuator member **56** designed to push the rollers **54** away from one another and detach the jaws **50** from the hub **47**, enabling rotation thereof. The actuator member **56** is carried by the slide **21** above the plane P**1** and is mobile, with respect to the slide **21** and under the thrust of a hydraulic actuator, away from and towards an extracted position of engagement of the channel **55**.

According to what is illustrated in FIGS. **5**, **8** and **13**, the blocking device **48** comprises a lever **57**, which is mounted on the casing **44** for rotating about an axis **58** parallel to the direction of advance **4** and extends towards the drive assemblies above the toothed ring nut **49**. The lever **57** has an intermediate tooth **59** facing the toothed ring nut **49** and normally coupled to the toothed ring nut **49** itself, and is provided, at its own free end, with a tappet roller **60** that can turn, with respect to the lever **57**, about an axis parallel to the axis **58**. The tappet roller **60** is designed to co-operate with a cup **61**, which is coupled to the slide **21** with interposition of a hydraulic actuator **62**, designed to displace the cup **61** vertically away from and towards an operative raised position, where the cup **61** engages the tappet roller **60** for rotating the lever **57** about the axis **58** so as to disengage the tooth **59** from the toothed ring nut **49** and thus free the shaft **39**.

According to what is illustrated in FIGS. **1** to **3**, the carriage **23** comprises an L-shaped cross member **63**, which is fixed with respect to the supporting arm **26** and comprises a horizontal portion **64** transverse to the direction of advance **4** and extending above the conveying channel **10**, and a vertical portion **65**, which is set on the side opposite to the supporting arm **26** with respect to the conveying channel **10** and carries connected thereto, at a free end of its own, a hydraulic pusher **66** sharing the axis **30** and being designed to co-operate, in the way and for the purposes that will be described in what follows, with a strut **67**, carried by the frame **14** and set coaxial to the shaft **43**.

Operation of the assembly line **1** will now be described in what follows, assuming, as first case, that the conveying units **5** have advanced along the conveying channel **10** and in the direction of advance **4** with continuous motion.

Operation will now be described starting from the operative configuration illustrated in FIG. **1**, where a conveying unit **5** has entered a rotation station **17** and the respective gondola **7** is passing, with a respective body **2**, in front of the carriage **23** associated to the rotation station **17** itself.

When the axis **43** of the shaft **42** of the motor-reducer device **41** is about to reach the position of alignment with the axis **30** of the shaft **29** of the motor **28**, the slide **24** is driven for displacing the carriage **23**, up to then stationary, in the direction of advance **4** in such a way that the shaft **29** is reached by the shaft **42**, and then advances in unison with the shaft **42**, remaining coaxial thereto (FIG. **5**). Furthermore, according to what is illustrated in FIG. **5**, in this operative condition, the jaw brake **46** is gripping on the shaft **29**, the lever **57** is in a lowered position with the tooth **59** engaging with the toothed ring nut **49**, the actuator member **56** is in an inoperative position, set back with respect to the front coupling **31**, and, finally, the cup **61** is kept by the hydraulic actuator **62** in a lowered, inoperative, position.

At this point, according to what is illustrated in FIGS. **2** and **6**, the slide **21** that carries the drive assembly **20** is displaced towards the conveying channel **10** and towards the gondola **7** in such a way as to bring the front coupling **31** into coupling with the front coupling **45**. Immediately after, the jaw brake **46** is released by displacement of the actuator member **56** into its aforesaid extracted position of engagement with the channel **55** (FIG. **6**), with consequent detachment of the jaws **50** from the hub **47**, and the blocking device **48** is deactivated by displacement of the cup **61** into the aforesaid raised, operative, position, with consequent disengagement of the tooth **59** from the toothed ring nut **49** (FIG. **7**). Furthermore, in order to counterbalance the axial thrust imparted on the gondola **7** by the drive assembly **20**, the hydraulic pusher **66** is advanced towards the gondola **7** and brought to bear upon the strut **67** (FIG. **2**).

At this point, according to what is illustrated in FIG. **3**, the motor **28** is driven to bring the shaft **29** into rotation and, along with it, the shaft **42**, the shaft **39**, and the pulleys **38** of the motor-reducer **41**, with consequent actuation of the belts **37** and rotation of the arched element **8** and of the body **2** about the axis **16**.

Detection of the angular position of the arched element **8** is made, preferably, via a recognition device of an optical type (not illustrated) comprising an encoded strip (of a known type), set on the arched element **8** between the two belts **37**, and an optical reader carried by the carriage **23** and capable of "reading" the encoded strip for transmitting to an electronic control unit (not illustrated), which controls the motor **28**, indications regarding the angular position of the arched element **8**.

Once the arched element **8** has reached the pre-set inclination, the motor **28** is stopped, and the slide **21** is driven to move the drive assembly **20** away from the motor-reducer device **41**. The regression of the slide **21** leads to immediate decoupling of the front coupling **31** from the front coupling **45** and, immediately after, disengagement of the actuator member **56** from the channel **55**, with consequent return of the jaws **50** into the normal position of gripping on the hub and blocking of the shaft **42** under the thrust of the respective spring devices **52**.

At the same time, moreover, the cup **61** slides underneath the tappet roller **60** until it disengages from the tappet roller **60** itself, leaving the lever **57** free to drop downwards and bring the tooth **59** to engage with the toothed ring nut **49**, with consequent blocking of the shaft **39**.

The jaw brake **46** and the blocking device **48** in this way guarantee that the arched element **8** maintains the inclination that has been imparted on it.

As soon as the conveying unit **5** is completely free, the slide **24** is stopped and immediately driven in the opposite direction to bring the carriage **23** back into the starting position, awaiting a next conveying unit **5**.

In this connection, it should be pointed out that the alternating displacement of the slide **24** can be obtained, not only by using a motor-driven slide as in the example illustrated but also with different systems, for example, via a cam-drive system or a hydraulic actuator.

Operation of the assembly line **1** in the case where the conveying units **5** have advanced in a steplike fashion in the direction of advance **4** remains substantially the same as the case with continuous motion described above except for the fact that, in this case, the carriage **23** is always stationary and each conveying unit **5** is stopped in the rotation station **17** when the axis **43** is aligned to the axis **30** in such a way that the front coupling **45** can be engaged by the front coupling **31** following upon advance of the drive assembly **20** via the slide **21**.

The invention claimed is:

1. A motor-vehicle assembly line (**1**) comprising:

an overhead guide (**3**);

a plurality of conveying units (**5**) each comprising an overhead slide (**6**) slidably coupled to the overhead guide (**3**), and supporting means (**8**, **9**) coupled to the overhead slide (**6**) to support a respective motor-vehicle body (**2**) to be assembled, each conveying unit (**5**) being displaceable in a direction of advance (**4**) through one or more rotation stations (**17**) where the respective supporting means (**8**, **9**) are mounted for rotation about a longitudinal axis (**16**) parallel to the direction of advance (**4**); and

rotation means (**18**) operable to rotate the supporting means (**8**, **9**) of each conveying unit (**5**) about the respective longitudinal axis (**16**) at each rotation station (**17**);

the rotation means (**18**) comprising:

for each conveying unit (**5**), an overhead driven transmission assembly (**19**) comprising a torque intake (**42**) arranged to receive a torque from a direction transverse to the direction of advance (**4**) and coupled to the supporting means (**8**, **9**) to responsively rotate the supporting means (**8**, **9**) about the longitudinal axis (**16**); and

for each rotation station (**17**), an overhead torque supply (**20**) comprising a torque takeoff (**29**) configured to engage the torque intake (**42**) of a said driven transmission assembly (**19**) carried by a said conveying unit (**5**) in the rotation station (**17**) to responsively rotate the supporting means (**8**, **9**) about the longitudinal axis (**16**);

wherein the torque intake (**42**) of each driven transmission assembly (**19**) comprises an input shaft (**42**) arranged transverse to the direction of advance (**4**) to receive a torque from said torque takeoff (**29**), and an output shaft (**39**) arranged parallel to the direction of advance (**4**) and coupled to the input shaft (**42**) to receive a torque therefrom; fast coupling means (**31**, **45**) being provided between the torque takeoff (**29**) and the torque intake (**42**) to allow fast coupling therebetween; and the output shaft (**39**) being coupled to the supporting means (**8**, **9**) of the respective conveying unit (**5**) to responsively rotate the supporting means (**8**, **9**) about the respective longitudinal axis (**16**); wherein each conveying unit (**5**) further comprises a frame (**14**) hanging from the slide (**6**) and defining an inner channel coaxial to said longitudinal axis (**16**), said supporting means (**8**, **9**) comprising an arched element (**8**) coaxial to said longitudinal axis (**16**) and slidably mounted within said channel.

2. The assembly line according to claim **1**, wherein the conveying units (**5**) are movable with a steplike motion in the direction of advance (**4**) to stop, within each rotation station (**17**), in a given position in the direction of advance (**4**), each torque supply (**20**) being mounted in the respective rotation station (**17**) in said given position.

3. The assembly line according claim **1**, wherein the conveying units (**5**) are movable with continuous motion in the direction of advance (**4**), each torque supply (**20**) being mounted for reciprocating within the respective rotation station (**17**) and parallel to the direction of advance (**4**) so as to move, in the direction of advance (**4**), simultaneously with each conveying unit (**5**) that moves through the rotation station (**17**).

4. The assembly line according to claim **1**, wherein each torque supply (**20**) is mounted in the respective rotation station (**17**) to move transversely with respect to the direction of advance (**4**) away from and towards a coupling position with the driven transmission assembly (**19**) of the conveying unit (**5**) in the rotation station (**17**).

5. The assembly line according to claim **1**, wherein the torque supply (**20**) comprises an electric motor (**28**) with an output shaft (**29**), which defines the respective torque takeoff, is arranged transverse to the direction of advance (**4**) and is designed to engage the input shaft (**42**) of the driven transmission assembly (**19**).

6. The assembly line according to claim **5**, wherein releasable blocking means (**48**) are provided for angularly blocking one between said input shaft (**42**) and said output shaft (**39**), said blocking means (**48**) comprising a toothed ring nut (**49**) fitted on the shaft (**42**; **39**) to be blocked, and an arrest tooth (**59**) mobile away from and towards a position of engagement with the toothed ring nut (**49**) under the thrust of first actuator means (**61**, **62**).

7. The assembly line according to claim **1**, wherein releasable brake means (**46**) are provided for angularly blocking one between said input shaft (**42**) and said output shaft (**39**), said brake means (**46**) comprising a pair of jaws (**50**), which are set on opposite sides of the shaft (**42**; **39**) to be blocked and engage the shaft (**42**; **39**) to be blocked itself under the thrust of elastic means (**52**), mobile wedge means (**56**) being provided for moving the jaws (**50**) away from one another against the thrust of said elastic means (**52**) and disengaging them from the shaft (**42**; **39**) to be blocked.

8. The assembly line according to claim **1**, wherein each driven transmission assembly (**19**) comprises a flexible transmission member (**37**), which extends along the arched element (**8**) and is anchored, at the two axial ends thereof, to respective free ends of the arched element (**8**), pulley means (**38**) being fitted on said output shaft (**39**) to engage an intermediate portion of the flexible member (**37**) and impart the arched element (**8**) a rotation about the respective longitudinal axis (**16**).

* * * * *